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34,537/63

COMMONWEALTH OF AUSTRALIA

PATENT SPECIFICATION

	Class	Int. Cl.
Application Number 34,537/63.	68.5; 68.3.	F25B.
Lodged 22nd August, 1963,		
Accompanied by a Provisional Specification.		
Complete Specification		
Entitled BORE PUMPS.		

Lodged 18th August, 1964.
Accepted 10th July, 1967.
Published 24th February, 1968.

Convention Priority -

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Actual Inventor GRESLEY LUKIN TOWNER.

Related Art:	118,221(8475/43)	68.5; 90.7.
	17,246/15	68.5.
	9733/19	68.6; 68.5.

The following statement is a full description of this invention, including the best method of performing it known to me:

Printed for the Controller of the Commonwealth by A. D. G. & Co., Government Printing, Canberra
93-1D-27/7/57-109.C.

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THIS INVENTION relates to reciprocating ^{plunger} pumps, either those driven by wind power or those driven by motor.

Such pumps are generally operated by a lever 5 to the lower end of which the pump plunger is attached, the lever being reciprocated by the power source to drive the pump.

On the up-stroke the pump has to lift a column of water the depth of the bore with consequent stress on the rod and power source.

As will be appreciated, this stress is periodic in nature and its onset is sudden on each occurrence with consequent strain and danger of breakage in the parts. This effect is accentuated by "water hammer" in the bore, caused mainly by resonance surges of pressure in the water column.

As a result, bore pumps are subject to breakdown and need constant repairs and inspection, which, particularly in remote bores, involves large expenditure.

An object of this invention is to reduce the stresses above referred to, and therefore reduce breakdowns.

~~A further object is to obtain a more uniform flow from the pump.~~

According to the invention, a bore pump includes an air space, the lower end of said space being open to the water pressure in the bore.

The air space may be provided in or surrounding the pump head, but preferably the air space is provided in a hollow section of the pump rod itself.

The latter arrangement lends itself very well to the modification of existing bore-pumps, all that is necessary

~~being the insertion of a special section in the existing rod.~~



AMENDED

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A further object is to obtain a more even flow from the pump and more efficient pumping.

It has been proposed in Australian Patent 17246/15 to provide an air chamber within a section of the pump rod, this air chamber being open to water pressure above the plunger and closed at the top. The air in this chamber serves as a "cushion" against mechanical shocks and water-hammer.

However, this prior arrangement has the disadvantage that the static water pressure, particularly in deep bores, compresses the air in the chamber so that water occupies a large part of it, decreasing the effectiveness of the cushioning. Furthermore, air tends to dissolve in the water under pressure leaving even less air in the chamber.

The present invention enables this problem to be overcome by providing means for recharging the air chamber of the prior arrangement from a compressed-air source, said means being accessible from the surface of the bore.

If the apparatus is then installed in a deep bore, water encroaches on the air chamber as before, but may be driven out again by compressed air introduced through the recharging means, restoring the efficiency of the device.

With the air chamber located within the pump rod, existing installations may be easily modified merely by substituting the hollow pump rod section or sections for the normal solid rod and installing the recharging means.



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~~Such a modification may be made and should be made to introduce the advantages of the invention into existing installations.~~

5 In order that the invention may be better understood, one particular embodiment will now be described by way of example with reference to the single figure of the drawings, which shows in section a bore pump according to the invention.

10 In general the bore is defined by a bore casing 10, in which a pump rod of jointed form reciprocates to drive a pump plunger, generally indicated at 11, up and down to lift the water in the casing 10 on the up-stroke. Pumps of this general type are well-known.

13 In this embodiment of the invention, the sections 12, 13, 14 of the pump rod are of special form to be described below, and are coupled between a reciprocating power source (not shown) and plunger 11.

20 Each section 12, 13 and 14 is formed of a hollow tube of high-strength material such as high-tensile steel or fibre-glass. A threaded socket 15 is secured in the upper part of each section and an externally threaded plug 16 in the lower part of sections 12, 13, the lower part of section 14 being open, the plugs 16 and sockets 15 being screwed together to join the sections, and a resilient washer 17 being provided to seal each joint.

25 Sockets 15 and plugs 16 are each provided with a central aperture 18 leading to the interior of the section.

The aperture 18 of socket 15 in the upper section 12 is closed by a non-return air valve 19 having means at its upper end to attach it to a compressor or air pump.

30 With the pump rod jointed together, there will



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be a continuous air space within it open at the bottom of section 14, and sealed by valve 19 at the top of section 12.

The bottom of section 14 is attached by suitable means, shown as a tubular member 20, to the pump plunger 11.

The member 20 serves to connect section 14 mechanically to plunger 11, while providing apertures 20A, through which the water pressure within the casing 10 has access to the lower open end of the section 14 and therefore the total air-space within the series of sections 14, 13, 12.

A reduced diameter part 21 of member 20 passes through an upper bucket washer 22, a spacer 23 and a lower bucket washer 24 and is secured by a nut 25 thereon.

The plunger 11 as is well-understood will allow water to pass the washers 22, 24 on the down-stroke but not on the up-stroke. The air space within the pump rod acts as a shock absorber, for sudden changes of water pressure whether caused by the reciprocation of plunger 11 or by water hammer.

In use, the plunger 11 on its pump rod is lowered down casing 10 and, as the water head increases, the air in the interior of the rod is compressed, water therefore rising some distance into the air space this water may be expelled by the introduction of compressed air through non-return recharging valve 19. As the pressure of water changes on reciprocation of plunger 11, the volume of air changes inversely and pressure shocks are minimized.

The narrower parts of the air space, such as the apertures 18 tend to slow down the movement of air or water

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within the pump rod and further resist sudden changes of pressure.

The practical effect of this cushioning is to reduce stresses on the working parts of the pump and prevent water hammer, so making for much longer life of the pump.

In addition it is found that with the recharged air space described the flow from the pump is almost constant instead of being of intermittent or "stop-start" type as in prior pumps.

If, after long use, the air is found to be gradually reduced by solution in the water, the air-space may be recharged by again passing air from an air-pump or compressor through the non-return valve 19 into the air-space.

Various modifications and changes may be made in the equipment described without departing from the invention as defined by the claims.

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The claims defining the invention are as follows:-

1. A reciprocating plunger bore pump having a casing, a pump plunger within said casing, a hollow pump rod for reciprocating said plunger, the interior of said rod forming an air chamber open to the water pressure immediately above said plunger, characterised in that the upper end of said air chamber is closed against leakage of air therefrom, but has means for recharging said chamber, said means being accessible from the surface of the bore.
13th
(22nd August 1963)

2. A pump as claimed in claim 1, wherein said means includes a non-return valve.
15th
(22nd August 1963)

3. A pump as claimed in claim 1 or 2, in which said air-chamber extends continuously to the surface of the bore.
18th
(22nd August 1963)

4. A pump as claimed in any prior claim in which said pump rod includes a series of hollow sections joined end-to-end in fluid-tight manner.
18th
(22nd August 1963)

5. A pump as claimed in claim 4, in which said air chamber is restricted in cross-section where said sections are joined.
18th
(22nd August 1963)



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6. A reciprocating bore pump substantially
as described with reference to the accompanying
drawing.
P-11 4
(22nd August 1967)

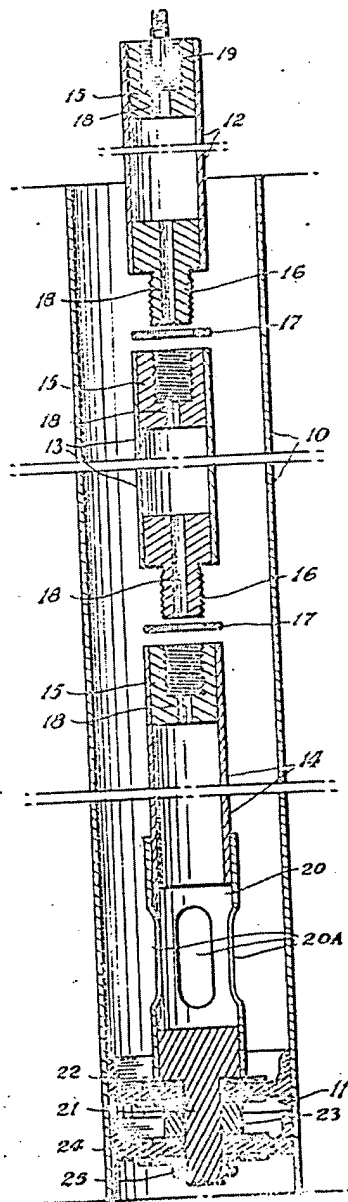
DATED this fifth day of May, 1967.

GRESLEY LUKIN TOWNER

By his Patent Attorneys
G. R. CULLEN & COMPANY



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